

PATCH-SIZED FLUID DELIVERY SYSTEMS AND METHODS

CROSS REFERENCE TO RELATED APPLICATION

[0001] The present application is a Divisional of U.S. patent application Ser. No. 15/489,144, filed Apr. 17, 2017, now U.S. Pat. No. 10,653,833, issued May 19, 2020 and entitled Patch-Sized Fluid Delivery Systems and Methods (Attorney Docket No. V09), is a Divisional of U.S. patent application Ser. No. 12/395,036, filed Feb. 27, 2009, now U.S. Pat. No. 9,623,198, issued Apr. 18, 2017 and entitled Patch-Sized Fluid Delivery Systems and Methods (Attorney Docket No. H05), which is hereby incorporated herein by reference in its entirety, and which is also a Continuation of each of the following applications:

[0002] U.S. patent application Ser. No. 11/704,899, filed Feb. 9, 2007, now U.S. Pat. No. 8,414,522, published Apr. 9, 2013 and entitled Fluid Delivery Systems and Method (Attorney Docket No. E70);

[0003] U.S. patent application Ser. No. 11/704,896 filed Feb. 9, 2007, now U.S. Pat. No. 8,585,377, issued Nov. 19, 2013 and entitled Pumping Fluid Delivery Systems and Methods Using Force Application Assembly (Attorney Docket No. 1062/E71);

[0004] U.S. patent application Ser. No. 11/704,886, filed Feb. 9, 2007, now U.S. Pat. No. 8,545,445, issued Oct. 1, 2013 and entitled Patch-Sized Fluid Delivery Systems and Methods (Attorney Docket No. 1062/E72); and

[0005] U.S. patent application Ser. No. 11/704,897, filed Feb. 9, 2007, now U.S. Pat. No. 8,113,244, issued Feb. 14, 2013 and entitled Adhesive and Peripheral Systems and Methods for Medical Devices (Attorney Docket No. 1062/E73), all of which claim priority from the following U.S. Provisional Patent Applications, and all of which are hereby incorporated herein by reference in their entireties:

[0006] U.S. Provisional Patent Application Ser. No. 60/772,313, filed Feb. 9, 2006 and entitled Portable Injection System (Attorney Docket No. 1062/E42);

[0007] U.S. Provisional Patent Application Ser. No. 60/789,243, filed Apr. 5, 2006 and entitled Method of Volume Measurement for Flow Control (Attorney Docket No. 1062/E53); and

[0008] U.S. Provisional Patent Application Ser. No. 60/793,188, filed Apr. 19, 2006 and entitled Portable Injection and Adhesive System (Attorney Docket No. 1062/E46), all of which are hereby incorporated herein by reference in their entireties.

[0009] U.S. patent application Ser. No. 11/704,899, filed Feb. 9, 2007, now U.S. Pat. No. 8,414,522, published Apr. 9, 2013 and entitled Fluid Delivery Systems and Method (Attorney Docket No. E70); U.S. patent application Ser. No. 11/704,896 filed Feb. 9, 2007, now U.S. Pat. No. 8,585,377, issued Nov. 19, 2013 and entitled Pumping Fluid Delivery Systems and Methods Using Force Application Assembly (Attorney Docket No. 1062/E71); U.S. patent application Ser. No. 11/704,886, filed Feb. 9, 2007, now U.S. Pat. No. 8,545,445, issued Oct. 1, 2013 and entitled Patch-Sized Fluid Delivery Systems and Methods (Attorney Docket No. 1062/E72); and U.S. patent application Ser. No. 11/704,897, filed Feb. 9, 2007, now U.S. Pat. No. 8,113,244, issued Feb. 14, 2013 and entitled Adhesive and Peripheral Systems and Methods for Medi-

cal Devices (Attorney Docket No. 1062/E73), may all be related to one or more of each other and may also be related to:

[0010] U.S. Provisional Patent Application Ser. No. 60/889,007, filed Feb. 9, 2007 and entitled Two-Stage Transcutaneous Inserter (Attorney Docket No. 1062/E74), which is hereby incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0011] This application relates generally to patch-sized fluid delivery systems and methods.

BACKGROUND

[0012] Many potentially valuable medicines or compounds, including biologicals, are not orally active due to poor absorption, hepatic metabolism or other pharmacokinetic factors. Additionally, some therapeutic compounds, although they can be orally absorbed, are sometimes required to be administered so often it is difficult for a patient to maintain the desired schedule. In these cases, parenteral delivery is often employed or could be employed.

[0013] Effective parenteral routes of drug delivery, as well as other fluids and compounds, such as subcutaneous injection, intramuscular injection, and intravenous (IV) administration include puncture of the skin with a needle or stylet. Insulin is an example of a therapeutic fluid that is self-injected by millions of diabetic patients. Users of parenterally delivered drugs would benefit from a wearable device that would automatically deliver needed drugs/compounds over a period of time.

[0014] To this end, there have been efforts to design portable devices for the controlled release of therapeutics. Such devices are known to have a reservoir such as a cartridge, syringe, or bag, and to be electronically controlled. These devices suffer from a number of drawbacks including the malfunction rate. Reducing the size, weight and cost of these devices is also an ongoing challenge.

SUMMARY OF THE INVENTION

[0015] In various embodiments of the present invention, a patch-sized housing for a fluid delivery system may include a reusable portion and a disposable portion that is removably engageable with the reusable portion. In terms of fluid delivery management, the disposable portion generally includes all of the fluid management components that come into contact with the fluid (e.g., a fluid path having various valve, pump, and/or dispensing regions bounded by flexible membrane material), while the reusable portion generally includes fluid management components that do not come into contact with the fluid (e.g., various valve actuators, pump actuators, and sensors that interface with the fluid path through the flexible membrane material). The reusable portion generally also includes most, if not all, of the components that would be considered reusable or non-disposable, such as, for example, a controller, an active mechanical assembly including a pump with valve and/or pump actuators and pump motor(s), one or more sensors (e.g., a fluid flow/volume sensor, a temperature sensor), one or more electrical power sources (e.g., a rechargeable battery) and related circuitry (e.g., a battery recharging circuit and a coil for inductively coupling the battery charging circuit to an external power supply), a network interface (e.g., a wireless